

REMARKS

This is in response to the Final Office Action mailed March 26, 2004. Claims 2-11 remain pending in this application.

Claims 2-11 have been rejected under 35 U.S.C. 103 as being obvious over Zhou in view of Lee. The Applicant respectfully disagrees.

Claim 3 recites that the optical bench has at least a portion of unitary construction comprising an integral optical spot size converter and optical alignment means (for fixing the position of an initially separate optical device relative to the optical spot size converter. In other words, the portion of unitary construction of the optical bench has both an integral optical spot size converter and optical augment means. Zhou does not anticipate the features recited in claim 3.

In Fig. 6, Zhou discloses an optical system with an optical device 620, waveguide coupling 610 and optical fiber 630. In Fig. 6 Zhou fails to disclose an optical bench, and merely discloses the individual components (optical device 620, waveguide coupling 610 and optical fiber 630) of a system for coupling light between the optical device 620 and fiber 630. None of the components in Fig. 6 are an optical bench. Zhou discloses an optical bench in Fig. 3, the bench supporting an optical fiber end and an optical device (laser diode). Clearly, the optical bench in Fig. 3 of Zhou however, does not have an integral optical spot size converter as called for in claim 3 (the fiber end being formed into a lens so that more light may be captured by the fiber). In paragraph 31, Zhou further discloses a silicon optical bench (SiOB) on which V-grooves are wet-etched

to guide the mounting or placement of photonic components including fibers, lenses and semi-conductor chips.

The Examiner states in the Action, that indeed Zhou does not expressly disclose the bench having unitary construction comprising an integral optical spot size converter and optical alignment mean (for fixing an initially separate optical device relative to the spot size converter). Nevertheless, the Examiner continues stating that it would have been (per se) obvious from Zhou alone, without more, for one skilled in the art to modify Zhou and make the optical bench of unitary construction having integral optical spot size converter and optical alignment means. The Applicant respectfully disagrees. The Examiner's argument is that it would have been obvious to one skilled in the art, simply from the bare disclosure in Zhou of an optical system (see Fig. 6) with a coupling 610 (having a spot size converter) between an optical device 620 and optical fiber 30, and of a bench (see Fig. 3) used for direct butt-joining a fiber (with a lens) to a laser, to integrally wed the optical coupling and V-groove system into a unitary portion of the bench. This argument is incorrect, at least for the reason that as noted before the bench in Fig. 3, has no optical coupling mounted thereto, (the lens is directly on the end of the optical fiber). Neither Fig. 3 nor Fig. 6, nor any other portion in Zhou provide any motivation or suggestion (that the combination is even possible or will be successful) to modify the bench in Fig. 3 by providing it with a portion of unitary construction having both integral optical spot size converter and optical alignment means.

The passages cited by the Examiner from Zhou merely serve to emphasize the state of the art and the problems associated with

coupling light between a planar optical device and an optical fibre.

Lee also fails to disclose or suggest any of the features recited in claim 3.

Lee is concerned with a planar optical device having an integrated spot size converter, and the spacing of the lower waveguide from the upper waveguide is in part dictated by the need for the lower waveguide not to impact on the active region of the upper waveguide, which forms the optical device. Nowhere does Lee disclose or suggest an optical bench with a portion of unitary construction comprising both integral optical spot size converter and optical alignment means as called for in claim 3. As neither Zhou, nor Lee disclose or suggest the features recited in claim 3, the combination of Zhou and Lee cannot provide features that are neither disclosed or suggested. Claims 2-3 and 6-11 are patentable over the cited prior art and should be allowed.

Claim 4 is similar to claim 3 in that it calls for an optical bench having at least a portion of unitary construction comprising an integral optical spot size converter and alignment means. Further, claim 4 recites that the spot size converter comprises an upper waveguide, having a reducing lateral taper along at least part of its length, vertically spaced a distance above a non-tapering lower waveguide. This is not disclosed or suggested in either Zhou or Lee. As noted before with reference to claim 3, Zhou and Lee fail to disclose or suggest an optical bench with a portion of unitary construction comprising an integral optical spot size converter and alignment means. At most, Zhou discloses individual photonic components that are individually mountable to an optical bench which is very

different from what is called for in claim 4. Lee, for its part fails to cure the defect in Zhou. Lee discloses a stand alone spot size converter (SSC). In Lee, there is absolutely no mention of an optical bench with a portion of unitary construction and the spot size converter being integral to the portion of unitary construction as otherwise called for in claim 4. In contrast, the SSC recited in claim 4 of the present application comprises an upper waveguide having a reducing lateral taper along at least part of its length, vertically spaced a distance above a non-tapering lower waveguide. The Examiner argues that the vertical spacing of two waveguides is disclosed in the SSC taught by Lee. However, Lee is concerned with a planar optical device having an integrated spot size converter, and the spacing of the lower waveguide from the upper waveguide is in part dictated by the need for the lower waveguide not to impact on the active region of the upper waveguide, forms the optical device. It is also noted that the upper waveguide of Lee's SSC converter tapers vertically not laterally. The design requirements and motivation of Lee's present integrated device-SSC are thus different to those of the present invention, where the SSC is independent of the optical device to be coupled to it.

Here again, the passages cited by the Examiner from Zhou merely serve to emphasize the state of the art and the problems associated with coupling light between a planar optical device and an optical fibre. Contemporary solutions involve integrating a SSC with the optical device (as per Lee) and providing means to align to an optical fibre or else some form of optical bench with alignment means on which a separate device, SSC and fibre may be mounted. None of the cited prior art teaches or renders obvious

an optical bench integrated with a SSC of the type recited in the claims of the present application, particularly claim 4. The Examiner simply asserts that claimed optical bench would be obvious to the skilled man in view of the cited art, without substantiating this assertion.

The present invention teaches a simple integrated optical coupling solution, which can be optimised, fabricated and tested independently of the optical device and optical fibre to be coupled, and which has alignment means for simple subsequent assembly. Furthermore, the SSC taught in the present invention can readily be optimised for a variety of devices and fibres by suitable adjustment of SSC parameters, including waveguide dimensions, spacing and taper.

Neither Zhou nor Lee disclose or suggest the features recited in claim 4, and hence the combination of Zhou and Lee cannot provide, features that are not disclosed or suggested in either reference.

In view of the above comments, it is respectfully submitted that current claims 2-11 are patentable over the cited prior art.

For all of the foregoing reasons, it is respectfully submitted that all of the claims now present in the application are clearly novel and patentable over the prior art of record, and are in proper form for allowance. Accordingly, favorable reconsideration and allowance is respectfully requested. Should any unresolved issues remain, the Examiner is invited to call Applicants' attorney at the telephone number indicated below.

The Commissioner is hereby authorized to charge payment for any fees associated with this communication or credit any over payment to Deposit Account No. 16-1350.

Respectfully submitted,



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6/28/04


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